UNIVERSITY OF MONTANA

AGRICULTURAL EXPERIMENT STATION

BULLETIN NO. 170 JANUARY, 1925

Montana Insect Pests for 1923 and 1924

Being the Twentieth Report of the State Entomologist of Montana

BY

R. A. COOLEY

Wheat stems with sheath removed, showing Hessian fly puparia or "flax seeds." This new pest has appeared in eastern Montana and is doing much damage.

BOZEMAN, MONTANA

LETTER OF TRANSMITTAL

Bozeman, Montana, January 8, 1925.

To His Excellency,
Governor John E. Erickson,
Helena, Montana.

My dear Sir:

I have the pleasure and the honor to hand you herewith my twentieth report as State Entomologist of Montana. The report covers the calendar years 1923 and 1924. In former years we printed a report each year. It is now our plan, in the interest of economy, to print only one report in two years. These reports are printed as a part of the regular series of bulletins of the Montana Agricultural Experiment Station.

In addition to duties in Montana State College and in the Experiment Station, I have served as State Entomologist of Montana since 1903. A continuous effort has been made to coordinate the work of the control of grasshoppers and other serious insect pests with the research conducted by the Experiment Station. While many other States have been under the expense of maintaining a separate State Entomologist's office, in Montana we have maintained the duties of this office in conjunction with the Experiment Station. There has been a saving of salaries and an avoidance of duplication of collections of insects, library, equipment, and housing.

I believe it is advisable to continue to carry this work as a part of the duties of the department of entomology of the Experiment Station. They can not be carried, however, without funds. The last legislature, because of a technicality in the law, reduced the appropriation to $150. It was necessary to dispense with the services of the assistant state entomologist, which seriously interrupted the continuity of the work.

It is most earnestly desired that serious consideration be given to placing the work of this office on a reasonably effective basis.

Very respectfully yours,

R. A. Cooley
State Entomologist

Twentieth Report of the State Entomologist

The original law providing for a State Entomologist was passed in 1903 and has not been amended. The sum of money then appropriated was $300, and this amount has been increased from time to time until in 1921 the sum available was $3900. At the last legislative session (1923) the Committee on Boards and Commissions called attention to the language of the original law, which reads as follows:

"Section 4. The State Entomologist shall receive no compensation for his services other than what he may receive from the Montana Agricultural College and Experiment Station, but his actual traveling expenses not to exceed three hundred dollars shall be paid, and such sum is hereby annually appropriated for the purposes of this act out of the moneys of the State Treasury, not otherwise appropriated."

This language was construed to mean that it was illegal for the State Entomologist to expend in excess of $300, or rather, in excess of $500; because evidently the committee had seen the law as it reads in the Revised Code of 1907, sections 766-769, where the sum appears as $500. In the closing hours of the legislature the appropriation for this office was fixed at $500, in keeping with the committee's findings, although the appropriation in the previous year had been $3900. When the Governor's 10 per cent reduction was made the amount available was reduced to $450 per year, which has been the sum received during the biennium now closing.

With only $450 in sight for the work of this office it became necessary to dispense with the services of the Assistant State Entomologist, Mr. A. L. Strand. Accordingly he was at once notified and departed during the spring of 1923 to an excellent position in Pennsylvania State College at an advance in salary. Mr. Strand had been with this department as Assistant State Entomologist since June 1, 1917. His service had been of the highest character and had resulted in tremendous savings in money to the farmers of Montana, not only from losses by grasshoppers but from losses by numerous other kinds of insect pests.

During the season of 1923 following the departure of Mr. Strand, it was necessary to restrict our activities in behalf of the farmers

mainly to what could be done from the office. In past years a system had been built up by which we have been able to get good results in cooperating against the ravages of insect pests. The State Entomologist's office outlines the campaign for the year, and communicates with the county agents and the county commissioners where there are no county agents. This office gets information regarding sources of supplies and prices and takes the leadership in campaigns. We have had material assistance from the county insect pest law of 1921. It being impossible to put an assistant in the field in 1923, it was decided to do what we could through correspondence and continuation of the organization that had been built up. Accordingly, mimeographed circulars of information were sent out and a correspondence was kept up with the various counties and as good a campaign put on as possible under the circumstances. However, the situation became rather alarming during the season and there were those in the State who believed that a catastrophe was impending because of the great hordes of grasshoppers that had appeared, notably in the north central portion of the State. Grasshoppers, after feeding to maturity and growing wings, had risen into the air until it was reported to us that they had hazed the sun. Great clouds of them had passed over but no one could tell just where they had come from or where they were going. The surrounding country was all seriously infested.

It was courteously brought to our attention also by representatives of the Canadian government that in their opinion grasshoppers were migrating from Montana northward across the international boundary into the Canadian provinces and reinfesting territory which had been practically cleared of grasshoppers. The province of Alberta had in the season of 1923 put on a very extensive campaign in which approximately three-quarters of a million dollars was expended. They were alarmed over the prospect that their land might be reinfested and they would have the work to repeat. Bankers and others interested in the welfare of the State, with heavy investments at stake, were interested in knowing whether or not the grasshopper outbreak would be repeated in 1924 and what steps were being taken to prevent such an outbreak. Reports of a very discouraging nature were received from various points in the northern part of the State.

THE GREAT FALLS CONFERENCE

Following a consultation between Mr. Stewart Lockwood, of the United States Bureau of Entomology at Billings, and the State Entomologist at Bozeman, in July, 1923, a general conference was called to take place at Great Falls on August 31st. Representatives of the railroads, bankers, the State Department of Agriculture, farmers' organizations, credit organizations, members of Congress, and entomologists from neighboring states were invited to be present. Representatives from the Canadian provinces to the north were also invited. Practically all of these organizations, as well as others, were represented and in addition many individuals were present. A one-day session was held at which reports were received of conditions in the several states and the Canadian provinces, as well as in the various parts of Montana. It developed that the situation centered in Montana and in the judgment of the entomologists present there was much prospect that a very serious situation might develop during 1924. The conference considered ways and means of meeting the situation. Consideration was given to asking Congress to furnish relief. A committee, consisting of the Commissioner of Agriculture, Mr. C. C. Davis, Mr. Stewart Lockwood, and the State Entomologist, was appointed to take charge of the situation and secure relief if possible.

After giving careful consideration to the facts which existed, it was determined to be inadvisable to ask Congress to make appropriations for the relief of the situation. The three members of the committee cooperated to canvass the State to determine more accurately just what the conditions were. We particularly desired to determine where and how extensive the egg-beds were in Montana in the fall of 1923. The State Entomologist was without funds. The State Department of Agriculture, through Mr. Davis, financed one-half of the survey and Mr. J. R. Parker, of the Experiment Station department of entomology, made the survey in the western half of the State. The Bureau of Entomology at its own expense very kindly assisted in the emergency and furnished both men and funds for a survey of the eastern half of the State. The reports of these two agencies were consolidated and appear in graphic form in a map (Fig. 3) which shows the location and extent of the egg-beds as they occurred in the fall of 1923. From the information accumulated it was very evident that there was much reason to believe that a serious outbreak of grass-

hoppers would again develop in 1924, and that it would be unwise for the State not to take account of it. Accordingly, the situation was brought to the attention of the Governor and a request made for authority to overdraw during the season of 1924. Detailed estimates of the sum were submitted, amounting to $9300, and approval of the plan secured from the State Board of Examiners. It was next necessary to find agencies to advance the money. Various plans were considered but in the end the State Bankers' Association was good enough to give us assistance in this matter. We wish here to acknowledge the excellent cooperation and effective assistance rendered by Mr. A. T. Hibbard, secretary of the State Bankers' Association. Through this association we were assured of a fund of $6600. and an effort was made to secure the services of an entomologist qualified to conduct this situation.

It was impossible to find a qualified person who would take the position with the conditions as they were in Montana. Those capable of doing this kind of work naturally had positions and did not care to make a change with any degree of uncertainty of tenure here. It was known throughout the United States that the State Entomologist in Montana had suffered a reduction in funds to the point where it was necessary to dismiss the Assistant State Entomologist. No one wanted to venture to take the position until an appropriation for this work had been regularly made.

We were confronted with the necessity of having a qualified man, yet with no one available to do the work. Mr. J. R. Parker, associate entomologist on the Experiment Station staff, who was particularly qualified in grasshopper work because of the research which he had been conducting, was placed in charge during the height of the grasshopper season. To do this was a marked injustice to the Experiment Station, for Mr. Parker was removed from his research work during just that portion of the year when he could most effectively pursue his studies on grasshoppers. The work of the Experiment Station suffered. It is by such work in the Experiment Station that we are able to meet outbreaks of insect pests in Montana in an effective manner. The money provided for this research work comes from Federal funds (Adams Fund) and it is necessary once a year to make an accounting to the Office of Experiment Stations in Washington. We can not again remove from the staff of the Experiment

Station a person to take charge of a pest control campaign in the State.

The fund provided by the State Bankers' Association, as mentioned above, was not all expended. In outlining how much money would be necessary, we had expected to put a regular assistant on the payroll. In this way we would have avoided a transfer of Mr. Parker to this work. As matters developed a part of the salary of Mr. Parker was paid from the State Bankers' fund for three months only. Again, as the season developed it was apparent that the grasshopper outbreak was not going to be so severe or so extensive as we had planned for and less money was needed for temporary assistants and their traveling expenses than had been expected. Therefore instead of expending $6600, as had been provided, we paid out $3399.85, which amount will be certified by the State Board of Examiners as a deficiency claim.

DUTIES OF THE STATE ENTOMOLOGIST

There is abundant evidence that the work and duties of the State Entomologist's office are not generally understood by the public, nor its relations with the State Board of Entomology well known. The confusion has arisen very largely because of the similarity of the names. The office of State Entomologist was established in 1903 (see Revised Code 1907, sections 766, 767). It is the duty of the State Entomologist to "conduct field investigations of the injurious insects of fruits, vegetables, grains, grasses, forage crops, including clover and alfalfa, root crops, shade trees, ornamental plants, and any other insects that may become injurious." In other words, the duties of the State Entomologist are concerned with the defense of agriculture against insect pests.

THE STATE BOARD OF ENTOMOLOGY

By an act of the legislature in 1911 (see Political Code of 1921, chapter 197) the State Entomologist was made a member and the secretary of the State Board of Entomology, on which board he cooperates with the State veterinary surgeon and the secretary of the State Board of Health. The creation of this board grew out of the spotted fever problem in western Montana. Previous investigations of the spotted fever situation by the State Department of Health under a former secretary and the entomologist of the Experiment Station at Bozeman had developed that the problem embraces entomological

work because of the spotted fever tick, veterinary work because domestic animals are involved in tick control, and the services of the board of health because spotted fever is a disease of human beings. Membership on the Board of Entomology is ex-officio and involves no additional salaries excepting for actual services of assistants in research and control work. The board members receive no compensation outside of their regular salaries elsewhere in the State organization. The duties of the State Entomologist have to do only with agriculture. The duties of the Board of Entomology have to do only with the health of man and domestic animals.

THE DUTIES OF THE STATE ENTOMOLOGIST MORE IN DETAIL

The duties of the State Entomologist in the control of agricultural insect pests will be better understood if presented somewhat more in detail. As originally drawn it was the intention of the law to make it possible for the Experiment Station entomologist to take his work into all the State and make it effective in the control of insect pests. This was necessary and still is necessary because the work of controlling insect pests is technical in nature and little understood by the public. The duties may be summarized under two headings: first, the State Entomologist meets emergency outbreaks of grasshoppers, cutworms, and so forth; second, he assists in the prevention of a large number of less important losses. There is always enough to do to keep him profitably occupied even if there are no emergency outbreaks, but for the last decade there has been scarcely a year in which there was not an emergency of major importance in the State. He cooperates with the county agents in counties where there are such agents and with other officials, such as Smith-Hughes teachers, county pest control leaders, and county clerks in counties where there are no county agents. He is the State leader in carrying out the provisions of the county insect pest law. (Political Code, 1921, sections 4501-4505). He takes the results of the research and experimental work on insect pests from our own Experiment Station and from other experiment stations to the farmers of the State. He conducts an extensive correspondence throughout the year on the control of insect pests in all branches of agriculture. He accumulates information on the sources of supplies, such as arsenic and the other ingredients of the grasshopper poison. He looks up spraying material and issues

circulars of information on these supplies for the guidance of county agents and for the benefit of the farmer. By this agency the Department of Entomology at the Agricultural College is kept in touch with the conditions and needs throughout the State, thereby making it possible to conduct its research work more effectively and more adequately to meet the needs of Montana.

OTHER DUTIES OF THE STATE ENTOMOLOGIST

Since the passage of the original law various other laws have been enacted placing added duties upon the State Entomologist. The county insect pest act (Political Code of 1921, sections 4501-4505) provides that the county commissioners in any county shall take steps whenever necessary to meet emergency outbreaks of insect pests. They may appoint suitable persons to act under the direction of the State Entomologist in the destruction of insect pests. County commissioners may purchase supplies and hire persons, thereby incurring expenses which may be paid from the general fund and in turn returned to the general fund by a special levy on the county not to exceed one mill.

The arrangement between the State Entomologist's office and the several counties provides that the counties shall take charge of local campaigns under the leadership of the county agents or some other authorized individual. This office provides a method of control according to up-to-date information on the subject and advises with the local officers throughout the State. It is necessary for representatives of this office to visit the several counties in order to decide such points as whether the campaign is necessary or whether the county pest act should be employed at all. It has been the policy of this office not to sanction the expenditure of county funds unless we were reasonably certain that a campaign would be successful. It it not possible to get results by correspondence alone. A considerable amount of expense is necessary for traveling in this connection. The agent of this office has information as to where supplies may be secured and can advise regarding amounts necessary and prices. He generally advises with the county commissioners and helps them to determine how much money it is necessary to set aside for the work.

It should be commented at this point that the county pest act has been a very effective assistance to this office and of immense value to many counties in meeting serious pest outbreaks. The triangular combination of a centralized state office, a county pest act, and a

system of county agents, provides an effective organization for this service and has resulted in the saving of millions of dollars to the farmers of the state of Montana. They have thereby been better able to meet their banking and other obligations and to pay their taxes during the period of stress through which the State has been passing.

THE INSECTICIDE AND FUNGICIDE ACT

The insecticide and fungicide act (Political Code of 1921, sections 2600-2614) provides that "it shall be the duty of the State Entomologist upon the advice and under the direction of the director of the Experiment Station to collect from time to time and deliver to the director of the Experiment Station specimens of insecticides, paris greens, lead arsenates, and fungicides in unbroken original packages, manufactured or offered for sale in the state of Montana, for the purpose of determining whether or not such insecticides, paris greens, lead arsenates, and fungicides are adulterated or misbranded within the meaning of this act."

This act is coordinate with the Federal insecticide act of 1910, the language of which is followed closely in the Montana act. It protects the State against the manufacture and sale within its boundary of adulterated and misbranded insecticides and fungicides.

COOPERATION WITH THE STATE DEPARTMENT OF AGRICULTURE

Cooperation of the Agricultural College and the Experiment Station with the State Department of Agriculture is provided for in section 7 of their act (chapter 216, 217, Session Laws of 1921.)

In practice it has worked out that the State Entomologist is cooperating rather extensively with the State Department of Agriculture and this office has received very much assistance from that department which it is very pleased to acknowledge.

In an informal manner the State Entomologist cooperates without specific authority in law with various other departments and agencies in the State.

NEEDS FOR THE COMING BIENNIUM

The interruption of the work of the State Entomologist by the suspension of the funds during the biennium now closing was a serious matter and difficult to bridge over. Through the cooperation of the State Bankers' Association a fund was provided to meet the

grasshopper situation in 1924 and a deficieney appropriation is being asked for to reimburse the bankers of the State. It so happened that the outbreak of grasshoppers was a matter pretty well understood by the county agents and it was possible to organize a fairly effective campaign on short notice. If the outbreak had been of some new pest, such as, for instanee, the Hessian fly, whieh during 1924 was found in the eastern portion of the State, then the situation would have been quite different and it would have been impossible to organize an effective eampaign without having an assistant in the position during the whole year. It should not be necessary for the state of Montana to go through sueh an experience again. Two things should be done. First, an amendment to the State Entomologist law should be passed making it legal for this office to expend such sums as the legislature may from time to time appropriate. An effort was made to get this amendment passed during the last session of the legislature but the matter did not eome up until a late date and we did not succeed in getting the measure through. Second, an adequate appropriation should be made which will enable us to meet emergencies and to carry on the regular routine work of the office which in itself is absolutely necessary in order that we may be able to meet emergeneies when they arise. It is quite impossible to maintain this kind of serviee without having an organization intaet all of the time. We ean not expeet to seeure the services of a competent person to do this work on short notice. Sueh people are already occupied and the continued serviee of an assistant, whom we have known as the Assistant State Entomologist in our organization, is necessary in order that we may be informed of eonditions in the State and be in position to meet emergeneies when they arise. There might be a year in which there was no outstanding emergeney, sueh as a grasshopper outbreak, but such would only afford us an opportunity to more effectively prepare ourselves for the serious situations which do arise nearly every year. We need information at all times from the four corners of the State and this can be secured only by organized, aggressive work. Moreover, there is always a host of lesser pests, the damage from which in the aggregate amounts to large sums of money. When emergeneies exist these minor affairs are largely neglected. In other words, in the past we have been driven by eircumstances and have not been permitted to organize our work and drive forward in a comprehensive

manner to meet the entire pest situation as it exists in the State. The means which we have had in the past have been wholly inadequate and we have been unable to make the savings that might be made.

Through the appropriate channels estimates for the work of this office have been presented for the consideration of the legislature. The total sum requested is $9300 per year, which will enable us to again have an assistant in the office, pay his traveling expenses, secure temporary assistants when emergencies arise and pay their expenses to act under the direction of the Assistant State Entomologist. This fund will also provide for office and laboratory expenses on a very moderate basis. It should be borne in mind in this connection that the State Entomologist is the entomologist of the Experiment Station and professor of entomology at the College. It is impossible for him alone to carry out the provisions of the State Entomologist law. The assistant is the active agent and works under the direction of the head of this department who coordinates all of the services in entomology in the institution. This duty was added to the Experiment Station entomologist in the interest of general economy in the State. Many states have a separate office to carry this work and it is often located at the state capital. Such an office requires an extensive equipment and a personnel to do the work. There must be a library, a collection of insects, and scientific equipment. Under the arrangement in force in Montana we have been able to avoid duplication of a library and large expense in accumulating insect collections and equipment. There are certain other advantages in the centralization of this highly specialized type of service. The Experiment Station has been kept constantly in touch with the needs of the State, and the research work that has been conducted has a much more direct bearing upon the needs of Montana agriculture than might well have been the case had the two not been officially connected.

COOPERATION OF RAILWAYS

Early in the season application was made to the railroads doing business in Montana to grant a half rate on supplies used by the farmers in making the poisoned bran mash to be used in killing grasshoppers. Rates were granted by the Great Northern, Northern Pacific, and Butte, Anaconda and Pacific railroads. No request was made of the Chicago, Milwaukee and St. Paul because we knew of no grasshopper difficulties in the portions of the State where that road

operates. Advantage of this was taken by many counties and sums amounting to several thousands of dollars in the aggregate were saved to the farmers. While this direct saving was much appreciated by the farmers, the fact that such a rate was made had much to do with putting on a more general and more extensive campaign than would have been possible without the concession, thereby resulting in much increased saving of crops.

SUMMARY OF THE GRASSHOPPER EXPERIENCES DURING THE PAST TWO YEARS

Montana in recent years has been experiencing a serious grasshopper outbreak. There has been more or less difficulty with this pest since 1917 but beginning with 1920 and continuing to the present time the outbreak has been widespread and very destructive.

Table I shows in brief form the campaigns conducted since 1921.

TABLE I.—SUMMARY OF GRASSHOPPER CAMPAIGN

	1921	1922	1923	1924
County funds used	94,735	184,999	94,844	42,030
Tons bait used	3,373	5,579	4,233	1,779
Acres treated	296,227	739,551	466,184	241,371
Estimated saving	593,112	2,477,150	1,616,750	794,300

It will be observed that in 1924 there was a considerable dropping off in the extent of the trouble. It is probable that in 1925 there will be still less trouble from this pest, yet we expect more or less difficulty. The species concerned is the lesser migratory locust which now can not be distinguished from the old Rocky Mountain migratory locust which fifty years ago was exceedingly destructive over an area in the Northwest extending through several years. Other species of grasshoppers have been present in a lesser degree, but the main source of trouble is the lesser migratory locust, scientifically known as *Melanoplus atlanis* Riley.

To our knowledge during these four years a total of $416,608 has been used from county funds and a conservative estimate of the savings effected through the joint agencies of this office and the counties has amounted to $5,391,312. Much greater savings could have been brought about if we had had a more adequate organization. We have been seriously limited because of insufficient funds.

The activities in grasshopper control are given by counties in Tables II and III as follows:

The extent of the grasshopper outbreak, year by year, is graphically shown in the maps presented in figures 1, 2, 3, and 4.

TABLE II—GRASSHOPPER CAMPAIGN SUMMARY FOR 1923.

County	County Funds Used	Tons Bait Used	Acreage Treated	Estimated Saving
Beaverhead	1,000	37	4,000	8,000
Blaine	3,500	125	12,500	56,000
Cascade	4,623	259	51,800	89,000
Carbon	4,005	120	12,000	25,000
Chouteau	2,200	95	10,000	30,000
Custer	270	16	2,000	4,000
Daniels		33	2,500	12,500
Fallon				
Fergus	15,000	264	30,000	120,000
Gallatin	2,880	87	19,684	100,000
Glacier	2,500	100	10,000	20,000
Jefferson	1,300	40	4,000	8,000
Lake	1,500	50	5,000	10,000
Lewis and Clark	2,000	420	40,000	120,000
Madison	4,000	164	12,000	55,000
Pondera	21,046	664	50,000	253,000
Phillips		32	4,000	20,000
Prairie	678	11	1,200	2,400
Ravalli	30	10	100	400
Richland	1,450	50	5,000	20,000
Roosevelt	567	40	8,000	44,950
Rosebud	333	5	1,000	5,000
Sanders	100	3.5	400	1,500
Sheridan	1,009	32	4,000	20,000
Stillwater	3,230	185	30,000	60,000
Teton	4,800	750	75,000	375,000
Toole	6,500	225	23,000	46,000
Valley	1,273	60	6,000	30,000
Wheatland	1,000	135	12,000	25,000
Yellowstone	1,459	230	31,000	62,000
Total	94,811	4,233	466,184	1,616,750

TABLE III—GRASSHOPPER CAMPAIGN SUMMARY FOR 1924.

County	County Funds Used	Tons Bait Used	Acreage Treated	Estimated Saving
Broadwater				
Carbon	1,200	39	3,906	7,500
Cascade	1,864	50	8,000	10,000
Custer	200	7	1,000	2,000
Deer Lodge				
Glacier	850	34	7,500	25,000
Gallatin	250	10	1,050	10,000
Granite				
Hill	2,700	64	8,000	40,000
Jefferson	250	6	800	1,500
Lewis and Clark	1,358	62	15,500	60,000
Liberty	400	20	3,000	5,000
Lincoln	135	1	100	300
Madison	1,500	80	8,000	20,000
Pondera	15,000	638	110,000	500,000
Powell				
Rosebud	125	2	500	500
Stillwater	2,683	130	11,000	20,000
Sweet Grass	1,800	91	11,000	20,000
Teton	4,000	500	30,000	50,000
Toole	8,500	105	20,000	100,000
Wheatland	1,123	40	7,500	10,000
Yellowstone	775	30	4,000	2,500
Total	$44,713	1,909	252,371	$814,300

FIG. 1.—DARK AREAS INDICATE THE LOCATION AND APPROXIMATE SIZE OF AREAS SERIOUSLY INFESTED WITH GRASSHOPPERS IN MONTANA IN 1922.

FIG. 2.—DARK AREAS INDICATE THE LOCATION AND APPROXIMATE SIZE OF AREAS SERIOUSLY INFESTED WITH GRASSHOPPERS IN MONTANA IN 1923.

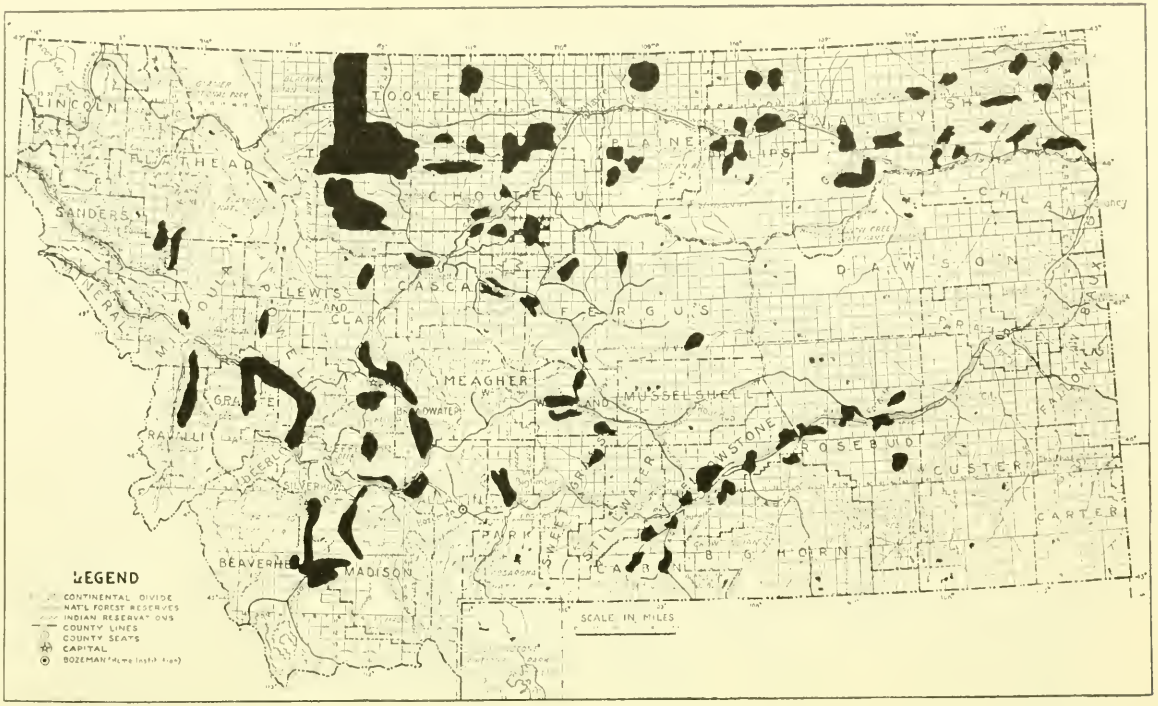

FIG. 3—DARK AREAS INDICATE THE LOCATION AND APPROXIMATE EXTENT OF EGG-BEDS OF GRASSHOPPERS IN MONTANA IN THE FALL OF 1923

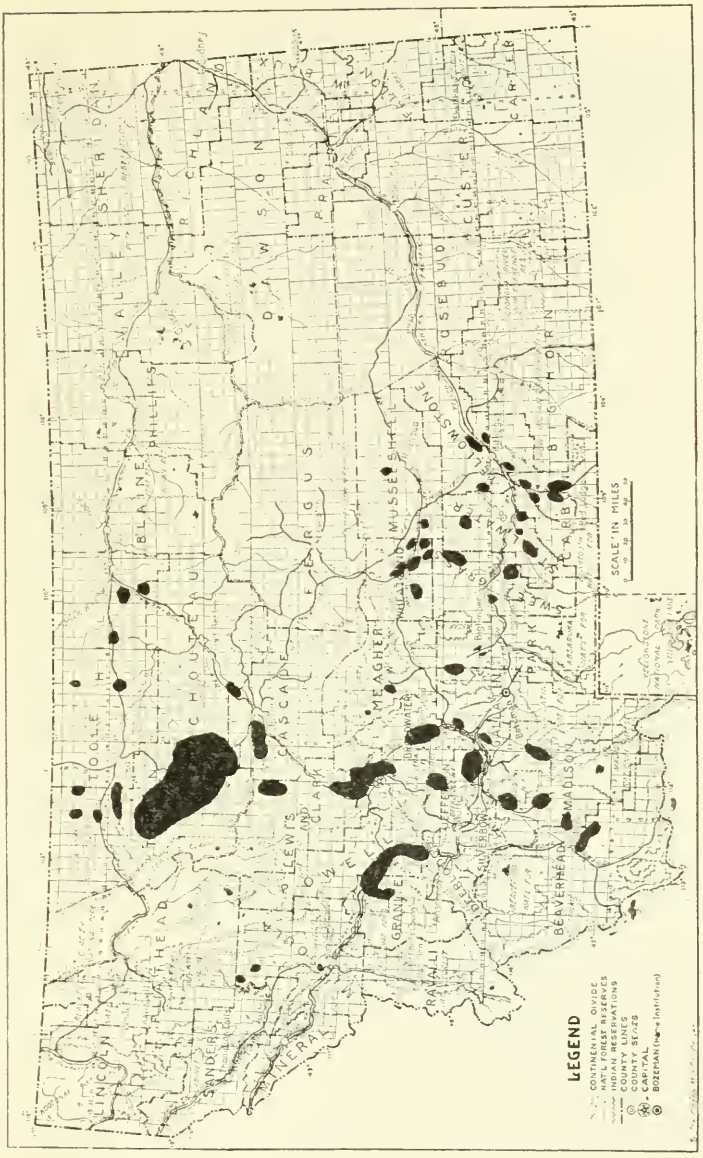

FIG. 4.—DARK AREAS INDICATE THE LOCATION AND APPROXIMATE SIZE OF AREAS SERIOUSLY INFESTED WITH GRASSHOPPERS IN MONTANA IN 1924.

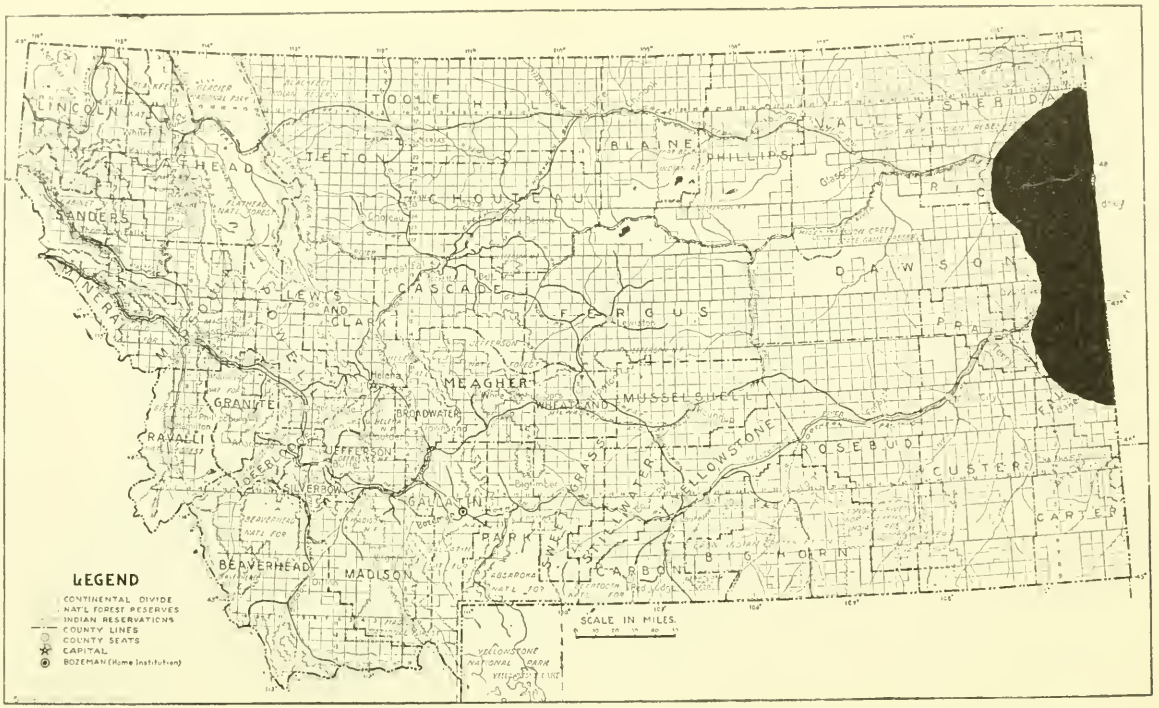

FIG. 5.—THE DARK AREA INDICATES APPROXIMATELY THE PRESENT LOCATION AND DISTRIBUTION OF THE HESSIAN FLY IN MONTANA. THIS INSECT HAS RECENTLY SPREAD INTO THE STATE FROM THE EAST AND IF IT CONTINUES TO SPREAD, UNCHECKED, IT WILL DO UNTOLD DAMAGE.

THE HESSIAN FLY

During the past season it has come to our knowledge that the Hessian fly has appeared in eastern Montana, where it has in some fields taken as high as 30 per cent of the crop. No one can tell what the future of this insect will be in Montana. It has a bad reputation elsewhere. On several occasions the damages in the wheat belt from this insect have amounted to upward of $100,000,000 in a single year. In 1922 the damage to the Iowa wheat crop alone was $1,500,000. From what we have seen already we know that this insect is capable of doing damage which if unchecked would prohibit wheat growing. The State Entomologist has lacked funds to make an adequate survey of the conditions. We do not know how far the insect extends. The nature of the insect is such that the farmer does not know of its presence in many cases. Unless an adequate appropriation is made to this office, the insect will spread, inflict its losses, and the farming public will remain largely in ignorance. The Hessian fly must be studied in each locality in order to know how to control it. So far it has been found in Richland, Roosevelt, Wibaux, and Dawson counties.

THE JACK PINE SAWFLY

Lodge pole pines in the vicinity of West Yellowstone in Montana and in Yellowstone National Park were seriously damaged during the summer of 1924 by an insect known as the jack pine sawfly. Wide areas of forest lands have been attacked by this insect, leaving a brown appearance as though swept by fire. The experience with this insect in other states would indicate that it is a pest of much importance but it will probably die out after a few years prevalence. Associated with this insect is the pine leaf tier (species undetermined).

AN INSECT DESTROYING THE LOCO

Dr. Howard Welch, of the veterinary department, brought to the attention of this department an insect very destructive to the loco plant. This proved to be a new species which has recently been described by Dr. W. Schaus as *Epischnia parkerella*. This insect is very abundant in Park and Sweet Grass counties where it has in some places, according to ranchers, been very valuable in ridding their ranges of loco. The insect bores into the crown and stem of the loco plant, causing it to wilt and die. The course of the life history was

followed during the summer. No parasites of this insect have yet been found.

THE FOUL BROOD DISEASE OF HONEY BEES

In earlier reports of the State Entomologist attention was called repeatedly to the need for a foul brood law. No provision was made for the control of foul brood disease of bees until the State Department of Agriculture law was set up and since that time it has been impossible for that division of the state service to do all that the commissioner has desired because of the lack of sufficient funds. The situation has been getting steadily worse until there is now no honey-producing area in the State which is not seriously diseased. No commercial producer of honey can pursue his business without an added heavy expense in labor and equipment in controlling American foul brood. There can be no doubt that the beekeeping industry will labor under this severe handicap through all time in the future unless steps are taken to control the disease in a state-wide and thoroughgoing manner. Moreover, this industry can not develop without first bringing this disease under control. Individual beekeepers are powerless. The assistance of the State is needed.

The beekeepers are willing themselves to pay a part of this expense and have drawn up provisions for a law to be submitted to this legislature providing that they pay heavy license fees. It is the hope of the beekeepers that the State will see fit to provide a fund equivalent to that raised from the license fees, dollar for dollar.

THE INSECT PESTS OF 1923 AND 1924

The Clover Mite (*Bryobia pratensis* Garman) appeared again in 1924 in the central portion of the State around houses, causing some annoyance to residents by entering through the windows. The species feeds on vegetation on the premises and simply gets into the houses in connection with its wanderings.

The Pear-Leaf Blister-Mite (*Eriophyes pyri* Pgst.) is now more a pest of apple than of pear. It is prevalent in the fruit-growing sections in western Montana where it persists year after year unless eradicated. It is one of the easiest orchard pests to control and the Experiment Station has literature on the subject.

The Red Spider (*Tetranychus populi* Koch), which was exceedingly abundant in Butte and in other cities in Montana in 1923, was

less abundant in 1924. This is true in spite of the fact that it came out of winter quarters in excellent condition in the spring of 1924. It is evident that the climate of the season was not favorable to these mites.

Earthworms (*Lumbricus* sp.). The common earthworm is increasingly the subject of inquiry from farmers, gardeners, and greenhouse men in Montana. It has been reported to us many times in recent years that the earthworm is injurious and information is desired regarding ways to destroy it. In intensive areas of cultivation, especially those which have had applications of manure, the worms multiply to surprising numbers and have a marked effect upon the physical condition of the soil and in some cases by their numbers interfere with the normal root activity. The subject is receiving some attention from the Experiment Station.

Silver Fish (*Lepisma saccharina* Linn.). This wingless insect, with a silvery, glistening appearance, often turns up in apartment houses. It feeds on starchy materials and delights in warm, moist places. Reports were received from the northern part of the State in 1924.

Millipeds (Species undetermined). Millipeds were reported as invading a mountain cabin in such numbers as to make residence in the cabin difficult, if not imposible. Millipeds feed on vegetable matter and prefer damp places. Other reports of a similar nature were received during the year of 1924.

The Winter Tick or Horse Tick (*Dermacentor albipictus* Packard). This tick, which is often confused with the spotted fever tick, is abundant in places in Montana. It makes its appearance early in the spring ahead of the spotted fever tick and is generally reported from horses. It is also abundant on mountain goats and occurs on the elk. In the season of 1924 this tick was the occasion of several reports.

Grasshoppers and Crickets (Orthoptera)

The Lesser Migratory Locust (*Melanoplus atlanis* Riley). This species is discussed more at length elsewhere in this report but it is recorded here that the species was very abundant and destructive in Montana both in 1923 and in 1924.

The Western Lubber Grasshopper (*Brachystola magna* Gir.). This, the largest grasshopper in Montana, a wingless species, which ordinarily is considered a rare find, appeared in a few localities in

eastern Montana in surprising numbers so that several quarts of them were collected and preserved in alcohol. While not an economic species, it occasions interest whenever seen by the farmer.

The Mormon Cricket (*Anabrus simplex* Hald.). These large crickets which sometimes appear in great numbers, eating everything in their path, were again present in both years in certain parts of the State, where some damage was done. A recent publication of the Colorado Experiment Station explains a method of destroying these insects.

The Jerusalem Cricket (*Stenopalmatus* sp.). This large, clumsy cricket is sent in nearly every year from the eastern portion of the State. It lives under stones and in loose soil. Because of their large heads and baby-like faces they are always objects of interest when found.

The True Bugs, Plant Lice, etc., (Hemiptera)

The Vagabond Poplar Gall (*Pemphigus vagabundus*). The grotesque galls produced by this interesting species were sent in again and again during the year by persons whose curiosity had been aroused. While not doing serious harm to the cottonwood trees on which they feed, the growths they produce disfigure the trees and are objectionable.

The Elm Gall Louse (*Schizoneura americana* Riley). This is perhaps the most serious enemy of the elm in Montana. A number of cities are becoming interested in spraying their trees to destroy the insects. It has now spread until nearly every elm tree in the State is affected. It persists year after year.

The Woolly Aphis (*Schizoneura lanigera* Hausm.). The woolly aphis, after a few years of less importance, appeared again in noticeable numbers in the western part of Montana during 1923 and 1924. The white masses of these insects can be seen for some distance. The insect is objectionable because of the fact that in picking the fruit in the fall the insects get crushed and stain fruit that otherwise would be marketable.

The Currant Leaf Aphis (*Mysus ribis* Linn.). The pale, yellowish-green plant lice of this species cause a distorting or a reddening of the foliage. Affected leaves were sent in repeatedly this season and the species was prevalent throughout the State.

The Cabbage Aphis (*Brevicoryne brassicae* Linn.). This very

common pest of cabbage was again injurious in 1923 on cabbages and cauliflowers.

The Apple Aphis (*Aphis pomi* DeGeer). These plant lice were in evidence in many orchards in the western part of the State in 1924.

The Spruce Gall Aphis (*Gillettea cooleyii* Gill.). The galls of this species are becoming rather common in parks and cemeteries in Montana. It is prevalent in the mountains in some parts of the State. It is not generally recognized that this growth is caused by an insect.

The Bedbug (*Cimex lectularius* Linn.). This insect continues to be abundant throughout the State, especially in old buildings. There is an increased interest in ridding bunk houses and other buildings of the pest, since adequate methods have been worked out. During 1924 the Experiment Station published a circular dealing with the control of this insect.

The False Chinch Bug (*Nysius ericae* Schill.). These insects, which in size resemble the chinch bug and at times become very abundant, were troublesome again during the season of 1924. They frequently swarm on garden vegetation. Generally they are more abundant on weeds and sometimes attack plants of value. In 1923 this species was outstanding in abundance.

The Chinch Bug (*Blissus leucopterus* Say). The true chinch bug does not occur in Montana. We have previously reported it as occurring here, due to an error in identification of the species, which we are glad to correct at this time. The species which does occur here is *Blissus occiduus* Barber.

The Flies (Diptera).

The Hessian Fly (*Mayetiola destructor* Say). This major pest of wheat was found in the state of Montana for the first time in 1924, it having spread across the eastern boundary. A considerable amount of damage was done and the scouting that has been conducted has shown that this pest is rather widely disseminated in that locality.

Crane Flies (Tipulidae). The larva of an undetermined species of crane fly was reported as exceedingly abundant in spring-plowed land near Moccasin in 1924.

The Currant Fruit Fly (*Epochra canadensis* Loew.). The currant fruit fly continues year after year a serious pest of currant and gooseberry fruits. It was more injurious in western Montana than else-

where during 1924. This insect alone is doing much to prevent the growth of currants in Montana.

The Cherry Fruit Fly (*Rhagoletis cingulata* Loew.) The cherry fruit fly was found in the northwestern part of the State in 1923. While it has not done great damage, so far as has been reported it may at any time be a pest of some prominence.

The White-Winged March Fly (*Bibio albipennis* Say). The larva of a March fly appeared in unusual numbers in gardens in 1924. In previous years it has been found in great numbers in sweet pea trenches and in garden tracts.

The Cabbage Maggot (*Phorbia brassicae* Bouche). This pest on the roots of cabbages was reported during 1923 as doing some damage.

The Beetles (Coleoptera)

Ground Beetles (Carabidae). We received reports of an undetermined species of this family of beetles injuring the ripened fruit of the strawberry in 1924.

The American Raspberry Beetle (*Byturus unicolor* Say). We received our first information of the presence of this pest of raspberries in the spring of this year, though the species has been present for some years in the locality reported, namely, near the southern end of Flathead Lake. It is a persistent and injurious species, objectionable especially because of the danger of shipping the grubs in the fruit when it goes to market.

Wireworms (Elateridae.) Almost every season sees some wireworms somewhere in Montana. The season of 1924 was notable for the prevalence of wireworms in potatoes and garden crops in Montana. Extensive damage was done by these insects boring through the tubers and rendering them unfit for sale. The species concerned has not been determined. Some trouble was also reported with wireworms in wheat and in corn.

The Flea Beetles (*Epitrix subcrinita* LeC. and *Psylloides punctulata* Melsh.).These minute, jumping beetles were again reported from gardens generally in the State in 1924, having injured numerous gardens as the seedling plants were just coming up.

The Three-Spotted Flea Beetle (*Disonycha triangularis* Say). This large flea beetle is apparently on the increase. It was received several times during 1923 and reported as injurious on various garden plants, particularly beets and spinach.

The Cottonwood Leaf Beetle (*Lina scripta* Fab.). The larvae of this beetle became abundant again in 1923, doing severe injury to shelter-belt willows in some parts of the State. The species has wide distribution, extending clear to the Atlantic Coast.

The Colorado Potato Beetle (*Leptinotarsa decemlineata* Say). This native American insect, which originally was present to the south of us, has now advanced over most of Montana and is proceeding northwest into British Columbia. It is single brooded in the Gallatin Valley and throughout the State is the occasion of some damage and much labor in spraying.

The Larder Beetle (*Dermestis lardarius* Linn.). This well-known insect appeared in injurious numbers in grocery warehouses and was the occasion of several letters of inquiry in 1923. It confines its attack to animal matter, including food stores.

The Spotted Blister Beetle (*Epicauta maculata* Say). This beetle occasioned many letters of inquiry because of its appearance in gardens, generally in the eastern part of the State, in 1924. We have noticed in past years that they have been especially abundant in years of grasshopper prevalence. The young of this mildly destructive species feed in the egg-pods of grasshoppers. They are not a real controlling factor in grasshopper abundance and, when doing damage, steps should be taken to eliminate them.

Nuttall's Blister Beetle (*Cantharis nuttalli* Say). This large blister beetle with bright, metallic colors is found abundant and injurious to the foliage of ornamental shrubs and sometimes on alfalfa and garden crops. It appeared again in abundance during 1923 and 1924.

The Confused Flour Beetle (*Tribolium confusum* Duv.). This minute beetle, a pest of stored cereals, crushed foods, etc., was reported as troublesome in a flour mill in northern Montana in 1923. It is widely distributed in the State. Mill owners and wholesalers should become acquainted with this pest.

The Granary Weevil (*Calandra granaria* Linn.). Several elevators reported this insect present in sufficient numbers to cause alarm in both years.

The Clover Head Weevil (*Phytonomus nigrirostris*). For several years this insect has persisted in regions in the western part of the State and has done some damage. It again attracted general attention

in 1923. Its appearance is so similar to that of the alfalfa weevil that wherever it appears it causes some alarm. It is a smaller species, however, and prefers clover to alfalfa.

The Strawberry Crown Girdler (*Otiorhynchus ovatus* Linn.). This world-wide species has for many years been more or less prevalent in Montana, especially in the western portion. This insect again turned up in 1924 and caused a considerable amount of alarm among strawberry growers.

The Rose Bud Curculio (*Rhynchites bicolor* Fab.). Growers of roses wrote to us in a number of instances in 1923 and in 1924 complaining that the rose buds were damaged by this red and black beetle. This is a native species, always present on wild roses, and often migrating to cultivated varieties.

The Plum Gouger (*Coccotorus scutellaris* LeC.). This enemy of plums in Montana east of the Rocky Mountain divide is a native species. It is always present, but in some years is more abundant. A considerable number of letters were received inquiring for remedies. This species is not to be confused with the plum curculio, from which it differs in color and shape, as well as in the fact that the larvae of the curculio never enter the pit, as they do in the case of the gouger.

The Pea Weevil (*Bruchus pisorum* Linn.). This insect has become of considerable interest in recent years, due to increased interest in pea culture for seed and canning purposes. It is fortunate that it is a less serious pest in northern latitudes.

The Common Bean Weevil (*Bruchus obtectus* Say.). We received a few complaints of the bean weevil in 1924. In view of the prominence of the bean-growing industry in recent years, it should receive the attention of growers.

The Moths and Butterflies (Lepidoptera)

The Achemon Sphinx (*Pholus achemon* Dru.). The caterpillar of this large Sphinx moth was sent in repeatedly from the Yellowstone Valley with the report that it was feeding on the Virginia creeper, indicating that the species was abundant during 1924.

The Poplar Sphinx (*Pachysphinx modesta* Harris). The large, fleshy caterpillars of this species were abundant on cottonwoods east of the mountain divide during the season of 1924.

The Cecropia Moth (*Samia cecropia* Linn.). This large showy moth always attracts attention. It was sent in several times during 1923

with inquiries regarding its habits. The caterpillars grow to a large size and require a good deal of food. Their presence on currant bushes sometimes alarms the gardener.

The Mediterranean Flour Moth (*Ephestia kuehniella* Zell.). This is probably the leading granary and flour mill pest of the Northwest. It sometimes gets into stored cereal products in grocery stores and warehouses. The caterpillars feed on all kinds of granary products and their webs running through the cereal clot it together. We have known it to do serious damage to bolting cloth in flour mills. It was reported repeatedly during 1924.

The Sugar Beet Webworm (*Loxostege sticticalis* Linn.). In recent years this species has been present in injurious numbers in some part of the State practically every year, though formerly it was little known excepting occasionally in sugar beet fields. Primarily a pest of sugar beets, this insect is also the cause of much injury to gardens and alfalfa. It feeds on many weeds and sometimes destroys the Russian thistle over large areas.

The Army Cutworm (*Chorizagrotis auxiliaris* Grt.). This important pest of cereals in Montana appeared in one locality, namely Judith Basin, in 1924. In earlier years this species has produced widespread devastation in Montana.

The Strawberry Leaf-roller (*Ancylis comptana* Frohl.). Growers of strawberries complained repeatedly of the ravages of this insect in 1924; and the fact that the ever-bearing strawberry is now so popular makes it more difficult than formerly to control the insect, for in former years the remedy was to mow the patch after the crop had been removed and burn over the field, thereby destroying the insect. This can not be done if a second crop is to be removed and we are reduced to spraying with arsenicals in advance of the removal of the first crop. This species also attacks blackberries and raspberries.

The Fruit-Tree Leaf-Roller (*Archips argyrospila* Walker). This prime pest of the apple tree which has been so prominent in recent years in the Bitter Root Valley still continues its attacks, though in somewhat reduced numbers in 1924.

Bees, Ants and Wasps (Hymenoptera)

The Wheat Stem Sawfly (*Cephus cinctus* Nort.). This pest of wheat, discovered in recent years in the extreme northeastern corner of Montana and later in the northern part of Stillwater County, was

in 1924 reported by County Agent Ferguson from Pondera County. No systematic survey has been made to determine whether the species occurs in the intervening territory.

The Leaf Cutter Bees (Megachilidae). These bees cut out circular and oblong patches from the leaves of rose, ash, lilac and other ornamentals and use them in the construction of their nests. It frequently happens that the individual rose bushes and ash trees are badly riddled, scarcely a leaf escaping attack. We have not had opportunity to experiment with this insect but believe that spraying with arsenicals would probably put an end to the difficulty. These insects again appeared in 1923.

The Lawn Ants (*Myrmica brevinodis* Emery). Residents in towns throughout most of the State are tormented year after year by ants in lawns which produce extensive workings and often enter food stores in houses. Many inquiries were received during the year and the new remedy of finely powdered sodium fluoride, scattered over the nests during hot, dry weather, was repeatedly recommended.

The Leaf-Folding Sawfly (*Pontania bozemani* Cooley). Cottonwood trees throughout the State are subject to the attack of this insect which folds over the edge of the leaf, producing the retreat for the caterpillar which grows to maturity inside. This insect was prevalent again in 1924.

The Yellow Jackets (Vespa sp.). In western Montana, particularly around Flathead Lake, for several years we have received complaints that hornets attack ripe, juicy fruits and do extensive damage. The complaint is that they attack plums, raspberries, and strawberries. These insects feed their young on honey or sweet liquids and doubtless regard the fruit juices as a substitute for honey. They also capture insects for their young and carry to them the flesh of dead fish or other animals. In 1923 and 1924 these insects were particularly troublesome.